Emerging Technologies and Smart Integration of Internet of Things (IoT) in Communication and Software Engineering

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Abstract— This paper presents the basic principles and technologies of Internet of Things (IoT) in the broad areas of Communication and Software Engineering application. Nowadays trends in IoT shows the a very broad impact on organizations to switch into new product business , affecting the existing business strategies , risk management, smart integration and a wide range of technical areas such as architecture , telecommunication , energy and network design have discussed in this paper.

Index Terms— Internet of Things (IoT), Smart Integration, Radio-Frequency Identification (RFID), Cloud Computing.

I. INTRODUCTION

The Internet of Things (IoT) is an active global information network, which consists of internet-connected objects like, RFIDs, actuators, sensors, along with other instruments and smart appliances that are becoming an integral component of the future internet [1]. The Internet of Things (IoT) is an important topic in engineering & technology, industry, agriculture and security systems. The basic idea of Internet of Things (IoT) model is the enveloping being there around us of a variety of objects or things – such as sensors , Radio-Frequency Identification (RFID) tags, mobile phones, actuators etc. – which, all the way through unique addressing schemes are able to interact with each other and assist with their neighbors to achieve common targets [2]. The main strength of the IoT concept is the high impact on several aspects of everyday domestic purposes and industrial applications [3]. From the last few years there is shift of industry towards the IoT technology, but even amid this environment connected devices are typically thought of as the preserve of additional developed markets[4]-[5].

II. EMERGING TECHNOLOGIES OF IOT

The emerging Internet of Things (IoT) is often discussed as a phenomenon of the future, rather than as an enabler of current applications. From an operational perspective, it is useful to think about how IoT devices connect and communicate in terms of their technical communication models. In March 2015, the Internet Architecture Board (IAB) released a guiding architectural document for networking of smart objects (RFC 7452), which outlines a framework of four common communication models used by IoT devices [6]. The IoT based communication models are briefly discussed below.

2.1 Device-Device Communications

The device-to-device communication model is shown in Figure 1 [7]. It represents two or more devices that directly connect and communicate between one another, rather than through an intermediary application server. These devices communicate over many types of networks, including IP networks or the Internet. However, these devices often use protocols like 40 Z-Wave, 41 or ZigBee42 and Bluetooth, to establish direct device-to-device communications. For home automation systems this communication model is usually used. Some examples of this communication model are residential IoT devices like switches, light thermostats, light bulbs, and door locks normally send small amounts of information to each other in a home automation scenario [7]-[9].

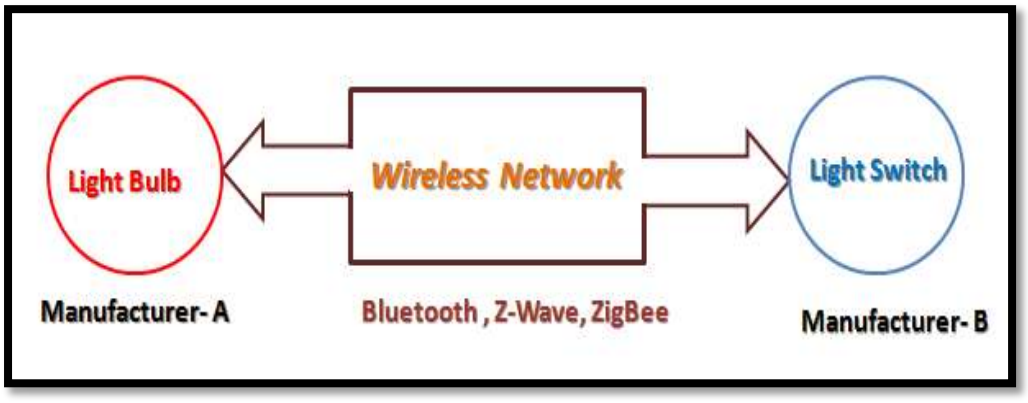

Figure 1. Example model of device-to-device communication [7].

2.2 Devices-to-Cloud Communications

The IoT device connects directly to an Internet cloud service like an application service provider to exchange data and control message traffic in case of a device-to-cloud communication model and is shown in Figure 2 [9]. This approach regularly takes advantage of existing

communications mechanisms like traditional wired Ethernet or Wi-Fi connections to establish a connection between the device and the IP network, which ultimately connects to the cloud service [8]-[10].

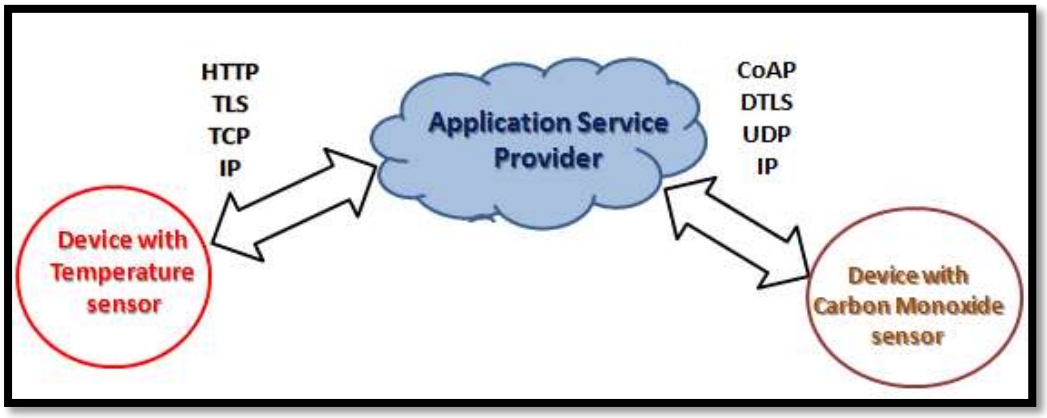

Figure. 2. Example model diagram of Device-to-cloud communication [7].

2.3 Device-to- Gateway model

Device-to-Gateway Model is shown in *Figure 3* [12]. In this model, the device-to-application-layer gateway (ALG) model, the IoT device connects through an ALG service as a conduit to reach a cloud service. In easier terms, this means that there is a software application which operates on a local gateway device, which acts as an intermediary between the device and the cloud service which further provides the functionality of data or protocol translation and security [11], [12],[13].

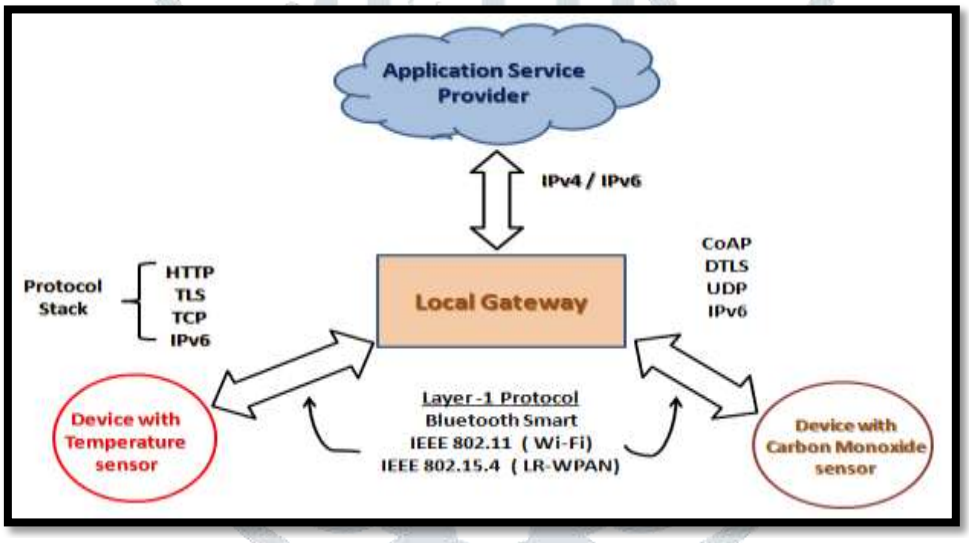

Figure. 3. Model diagram of Device-to-gateway communication [12].

2.4 Back-End Data-Sharing Model

The back-end data-sharing model is shown in Figure 4 [12]. It refers to a communication architecture that enables users to export and analyze smart object data from a cloud service in combination with data from other sources. This architecture supports the users desire for granting access to the uploaded sensor data to third parties". This approach allows the data collected from single IoT device data stream to be aggregated and analyzed [11]-[13].

III. CONCLUSION

This paper briefly discussed the IoT principles, emerging trends in the areas of Communication and Software Engineering has been discussed.

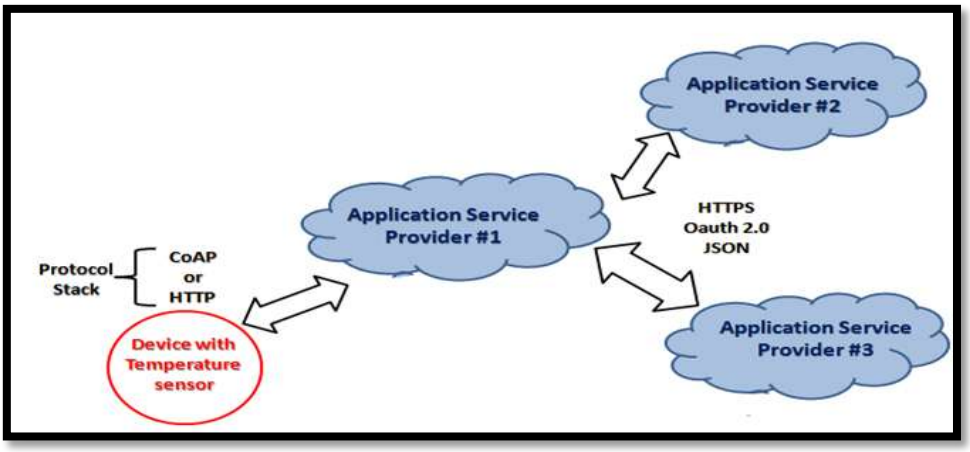

Figure. 4. Model diagram of Back-end data sharing [12].

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